

ABSTRACT

The present invention is directed to a particle beam processing apparatus that is smaller in size and operates at a higher efficiency. The processing apparatus includes a particle beam generating assembly, a foil support assembly, and a processing assembly. In the particle beam generating assembly, a cloud of particles, for example, electrons, are generated by heating at least one tungsten filament. The electrons are then extracted to travel at a high speed to the foil support assembly which is set at a much lower voltage than the particle beam generating assembly. A substrate is fed to the processing apparatus through the processing zone and is exposed to the electrons exiting the particle beam generating assembly and entering the processing zone. The electrons penetrate and cure the substrate causing a chemical reaction, such as polymerization, cross-linking, or sterilization.